THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

Vol. VII.—No. 149.

THE SOCIETY OF TELEGRAPH ENGINEERS.

For a considerable time past there has been a feeling of dissatisfaction among many members of the Society of Telegraph Engineers at the present condition of the Society and the conduct of its public business. These members have held the opinion that the Society, as at present constituted and operated, does not meet the wants of the whole electrical profession, and the flourishing state of electrical science; that it is too technical in its character, and too restricted in the scope of its deliberations. However unexpressed, such ideas have been prevalent; and Mr. Latimer Clark, in addressing a letter to the President and Council of the Society on this subject, has only placed himself in the position of spokesman for a large body of electricians and men of science connected with the Society. From his scientific eminence and his influence on the Council, Mr. Clark is marked out as the natural leader of the new movement.

The letter in question calls attention to the danger and disadvantages likely to occur to the Society from following too closely in the footsteps of the Institution of Civil Engineers, and assuming a rigidly professional character—a danger which Mr. Clark has repeatedly pointed out—and dwells on the advantages of attracting the support of that large and increasing body of electricians who have no connection with telegraphic engineering, or the practical application of electricity, but who pursue the subject from a pure love of science. He hints that this class may ere long become sufficiently numerous to form an independent society unless they are provided for by the existing society, and suggests that the scope of the latter should be widened so as to include them; and that it should assume a dual character and name, and become "The Electrical Society and Society of Telegraph Engineers." It cannot be denied that the Society of Telegraph Engineers, as at present conducted, is inadequate to the electrical wants of the time. Devoted as it is in practice, whatever it may be in theory, to the consideration of strictly technical subjects, it repels rather than invites the co-operation and sympathies of original investigators and students in electricity. A fascinating science like electricity has an abundance of amateurs who would gladly avail themselves of a purely electrical society where the latest advances were brought before them. As the Society exists at present, however, it is almost lost time for men of science or amateurs to attend its meetings. The enunciation of professional details, however interesting to the small group of experts diluted with a few incipient telegraphists, is a weariness of the flesh to them, and we can only wonder that some eminent professors support the Society as faithfully as they do. The time is ripe for a change of the kind indicated by Mr. Clark. Telegraph engineering no longer covers almost the entire field of electrical work. Electric lighting has suddenly established itself as an extensive and permanent application of electricity; and there is now hardly an art or science which does not engage the services of the occult agent in some way or other. It would be blind suicide, therefore, of the Society of Telegraph Engineers to pursue its narrow course, impoverishing itself by its exclusiveness, while the science to which it is in spirit at least, if not in letter, devoted, is rapidly becoming more important and fertile in results. Unless it widens its scope so as to meet the wants of the new electrical science it will certainly prepare for itself a rival; but, as Mr. Clark has said, a rival society is not wanted. The improvement of the old society would indeed be a boon; but a new society would be an affliction; for the electrical arena is yet too small to admit two competitors, without one or the other being ere long driven to the wall. The existing society holds also a strong position in its prestige, its Ronalds' Library, and its connection with the Institution. It would be unwise to foster any schism in its ranks, although such a course might perhaps appease an individual spite or two, and Mr. Clark has, we think, acted wisely in discountenancing any such action. By widening its scope so as to include electrical amateurs and investigators, and altering its title accordingly, the Society of Telegraph Engineers will greatly augment its resources, and take a new lease of life, by the infusion of fresh blood which it will receive.

Mr. Clark suggests that certain evenings should be devoted to purely electrical papers, and others to those of technical import. We cordially agree with this, for there should be a certain amount of differentiation in the conduct of the meetings; but this differentiation ought not to be carried too far, and we think that the prosperity of the Society might be endangered by allowing the scientific evenings to assume a separate character. These scientific evenings will prevent the occurrences we have seen of late at the Society, by which the most original communications of the session, the

paper of Mr. Cowper on his "Telegraphic Pen," and Prof. Hughes' "Researches on Induction," have been hurried over, to make room for dusty lucubrations on fossil modes of signalling, and desultory remarks on the peculiarities of Cape telegraph poles. We are far from depreciating the interest and value of such useful themes as these, but we must say that a new invention, or a new research is of far more vital importance.

In conclusion, we would venture to suggest to the President and Council of the Society of Telegraph Engineers, the advisability of constituting commissions within its body for the consideration of questions which only such a body of experts are fitted to decide upon. The French Academy of Sciences and many other bodies avail themselves of a machinery of this kind, to consider and judge those scientific questions which are brought to their notice. They form, in fact, a scientific tribunal or court of science. Disputes between rival inventors about priority and equivalence of inventions, could be referred to such a tribunal, and we should through its agency, be spared the spectacle of public wrangling over electrical results which sometimes distracts the attention, and discredits the pursuit of science. We do not of course mean that the Society should busy itself with disputes of this kind; but simply that the Society should have powers to form a competent jury when its offices are required to protect the interests or reputation of its members, and decide a question which can only be decided by an authorised body of experts.

M. ADER'S TELEPHONE WITHOUT A DIAPHRAGM.

By M. LE COMTE DU MONCEL.

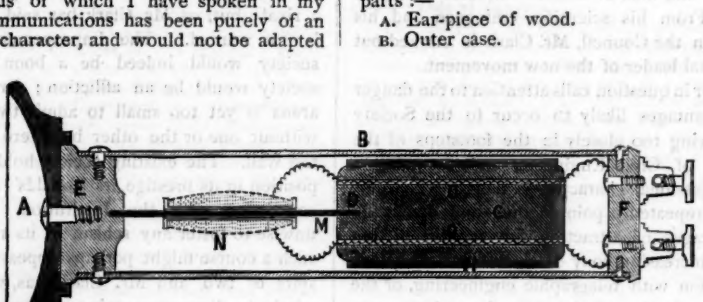
THE apparatus of which I have spoken in my preceding communications has been purely of an experimental character, and would not be adapted for practical purposes. The actual form of the telephone of M. Ader is that shown by the figure, which represents a longitudinal section of the instrument. The difficulty which was presented in the first instance was that of acoustically insulating the two extremities of the iron wire which is terminated at each end by metallic masses. In order to solve this problem, it was found necessary to envelop one of the two masses in india-rubber, so that this mass could be placed in a metallic case fitted to the other mass, so that no confusion of vibrations, which was referred to in my last article, resulted.

When simple voltaic currents are employed to make the instrument work, a well annealed iron wire must be employed; but, if induction currents are used, as in the Edison system, which allows the apparatus to work to a long distance, the iron wire should be replaced by a strongly magnetised needle. The induced currents cannot work telephones constructed with a simple iron wire.

The telephone is extremely portable and efficient, and, moreover, is, in outward appearance, similar to the ordinary Bell telephone.

In the figure, the following are the several parts :—

A. Ear-piece of wood.
B. Outer case.



C. Mass of lead.
D. Copper disc soldered on the lead.
E. Copper mass.
F. India-rubber mass.
H. Flexible envelope of india-rubber for insulating the vibrations of the mass C.
M. Bar of iron one millimetre in diameter, well annealed, and soldered to the mass E, and to the disc D.
N. Olive-shaped bobbin wound with fine insulated wire, and placed in the middle of the iron bar.
O O. Holes through the lead mass through which the conducting wires pass.

The whole mass C, D, does not fit tightly in the case B, but has about a millimetre of space around it.

A COMPANY is about to be formed for the purpose of working the patent of Mr. Edison's new telephonic receiver and carbon transmitter.

PROFESSOR HUGHES ON INDUCTION.

IN our last issue we endeavoured to show as clearly as possible within the limits of a short article, the difference between the chief results of the recent researches of Prof. Hughes on Induction, and the results of his predecessors in that study. At the time we wrote we were unaware that Mr. Edison had done anything to this subject, not having seen his English patent No. 2909, dated July 30, 1877; but before our article appeared, Mr. Edison had sent a telegram to this country claiming priority of authorship of Prof. Hughes' results. We mention this fact to prevent misconception, for it might be thought that the article in question had been written subsequently to the arrival of Mr. Edison's telegram. We have examined the English patent cited by Mr. Edison as anticipating Prof. Hughes' results, and find it to contain the following passage:—"Where several line wires run near each other, the wire used for the acoustic or speaking telegraph is influenced by induction, and false sounds will be produced. I counteract this tendency by placing one or more electro-magnets 59, fig. 28, in the circuit of the speaking telegraph, and one or more electro-magnets 60 in the circuit of the adjacent wires, and bringing the opposite cores of 60 at such a distance from the cores of 59 that a certain magnetic action will be set up in 59, by induction in the opposite direction to the induction currents from the adjacent line or lines. By adjusting the distance between these magnets when the speaking telegraph is not in use, until there is not any sound at the diaphragm from the induction currents, then these currents will be neutralised, whether strong or weak, and will not produce any false sounds when the speaking telegraph is in use.

I also employ double coils of wire for the same purpose, one coil being in the acoustic wire, and the other in the wire to be compensated."

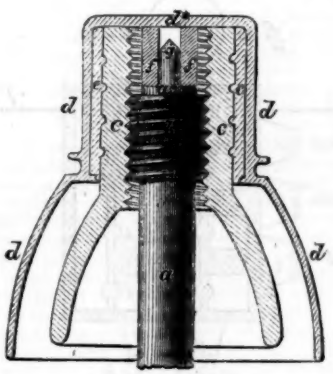
This passage contains the basis of Mr. Edison's claim as far as the English patent is concerned, and we think it is clear that what is here aimed at is simply to protect a telephone wire from the induction of neighbouring lines worked in the ordinary way and not as Professor Hughes intends, to correct the mutual induction of any number of wires, however worked. It is obvious also from the text, and it is shewn in the drawings, that Mr. Edison's magnets and coils are permanently connected in circuit; whereas, one of the distinctive features of Professor Hughes' device is to connect these compensating coils to the signalling keys, so that the latter can reverse their direction in signalling. Nor does Mr. Edison make any mention of Professor Hughes' plan of arranging the coils with respect to length, altitude, and distance, so as to make an artificial model of the actual line. In short, we can discover nothing further in Mr. Edison's specification than what has been already credited to Mr. Wilson, of Chicago, and has occurred to several of our own electricians, including Dr. Muirhead, in one of whose old note books we have seen it set down. Professor Hughes has told us at the recent meeting of the Society of Telegraph Engineers, which we report in this number, that it is not this well-known plan which he would put forward as novel, but the artificial line, and the reversing arrangement. We have yet to learn if Mr. Edison's American specifications contain these.

OPPENHEIMER'S LIGHTNING GUARD INSULATOR.

THIS invention is designed to obviate the inconvenience which arises in working telegraph lines from the breakage of insulators by lightning, and a consequent making of earth contact by the conducting wires. In order to avoid this kind of fault a lightning discharger is introduced in the interior of the insulator, which is provided with a metallic covering.

The accompanying fig. shows a section of the improved insulator.

At *a* is the metallic insulator pin connected with the post, supposed in this case to be of metal, and having formed or attached thereon a screw *b* which



supports the earthenware or other such insulator *c*, open at the top, as shown in the fig. On the outside of this insulator is a metallic cap *d*, secured by means of cement *e*, and to this metallic cap the telegraph line wire is attached in the ordinary manner.

Upon the top *a** of the insulator pin is placed a ring *f* of insulating material, and the distance to which this ring extends determines the distance between the top of *d** of the cap and an extended part *g* of the pin *a*. This distance may be varied to some extent, but that shown in the fig., which is ¼ scale, may be taken as the relative standard.

By this arrangement an effective lightning discharger is obtained within the insulator, the lightning passing through the top *d** of the cap to the post *g*, and from thence along the pin *a* to earth.

In cases where wooden posts are used, the pin *a* may be connected to earth by means of an earth wire in the usual manner.

A NEW FORM OF SHUNT BOX.

By J. RYMER-JONES.

ALTHOUGH the introduction of a shunt between the terminals of a galvanometer G, having a resistance $\frac{G}{n-1}$, reduces the strength of the current passing through the galvanometer to $\frac{1}{n}$th of that which leaves the battery; yet, since the total resistance in circuit is at the same time reduced, the amount of the current from the battery is increased, so that the deflection on the galvanometer has a larger fractional value than that indicated by the shunt. When making experiments, it is the practice, in order to reduce the deflection to exactly the amount represented by the shunt, to introduce a compensating resistance equal to $G - \frac{G\,S}{G+S}$ or $\frac{G^2}{G+S}$ into the battery circuit.

To obviate this necessity, a shunt box has been designed by Mr. H. R. Kempe, a detailed description of which appeared in the TELEGRAPHIC JOURNAL (Sept. 15th, 1878), in which, by an ingenious distribution of compensating resistances, the total resistance in circuit always remains the same, whatever may be the value of the shunt.

The arrangement of a shunt box, having the same end in view, is shown in fig. 1; and, as it possesses one or two slight advantages, it may, perhaps, be worth describing.

Let the resistance of the galvanometer G = 5,000 ohms. It is required that the resistance in circuit between the leading wires *l*, *l*¹, connected to the shunt box, remain constant, whatever may be the multiplying power of the shunt.

If

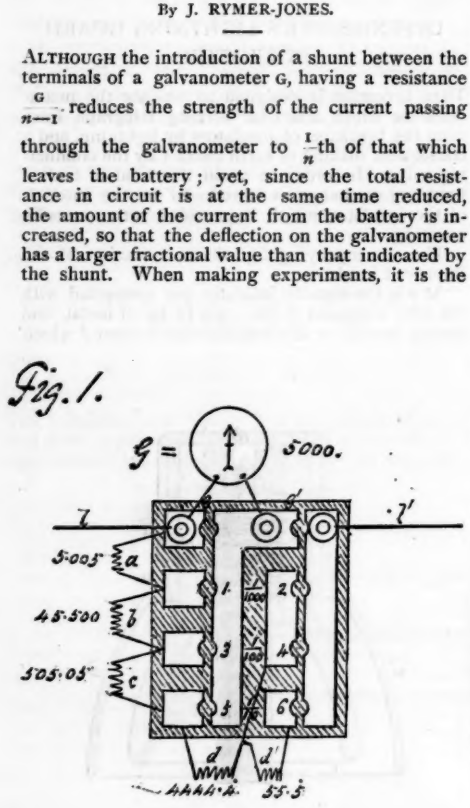
a	= 5·005	ohms =	resistance of $\frac{1}{1000}$th shunt	s.
$a+b$	= 50·505	,, =	,, $\frac{1}{100}$th ,,	s_1.
$a+b+c$	= 555·5	,, =	,, $\frac{1}{10}$th ,,	s_2.

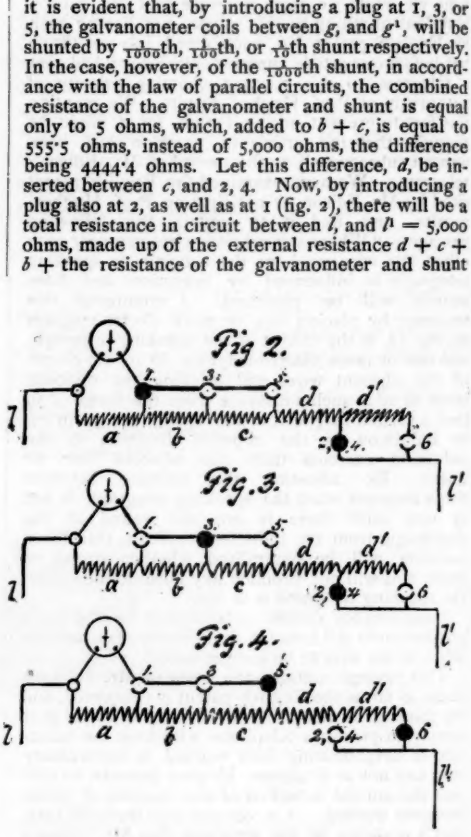
it is evident that, by introducing a plug at 1, 3, or 5, the galvanometer coils between *g*, and g^1, will be shunted by $\frac{1}{1000}$th, $\frac{1}{100}$th, or $\frac{1}{10}$th shunt respectively. In the case, however, of the $\frac{1}{1000}$th shunt, in accordance with the law of parallel circuits, the combined resistance of the galvanometer and shunt is equal only to 5 ohms, which, added to $b + c$, is equal to 555·5 ohms, instead of 5,000 ohms, the difference being 4444·4 ohms. Let this difference, *d*, be inserted between *c*, and 2, 4. Now, by introducing a plug also at 2, as well as at 1 (fig. 2), there will be a total resistance in circuit between *l*, and l^1 = 5,000 ohms, made up of the external resistance $d + c + b$ + the resistance of the galvanometer and shunt taken parallel, while the galvanometer will be shunted with $\frac{1}{1000}$th shunt.

Next let the plugs be removed to 3 and 4 (fig. 3). Then the resistance $a + b$ (= 50·505 ohms) is parallel to the galvanometer coils *g*, g^1, and reduces the deflection to $\frac{1}{100}$th. In this case their combined resistance is 50 ohms, which, $+ c + d$ = 5,000 ohms.

Thus, the total resistance in circuit between *l*, and l^1, is still equal to G, and the galvanometer is shunted by $\frac{1}{100}$th shunt.

Lastly, if the plugs be inserted at 5 and 6 (fig. 4), the galvanometer is shunted by $a + b + c$ (= 555·5 ohms, or $\frac{1}{10}$th shunt, s_2). The resistance of galvanometer and shunt, therefore, when parallel, amounts to 500 ohms, which $+ d$ = 4944·4 ohms





only; but when the plug is transferred from 4 to 6, an additional external resistance d^1 (= 55·5 ohms) is introduced into the circuit, which brings the total resistance between l, and l^1, up to 5,000 ohms as before, so that the intensity of the current which leaves the battery is in all three cases the same. Hence the product of the deflection on the galvanometer (provided that the readings are proportional), and the corresponding multiplying power of the shunt is exactly equal to that obtained on the unshunted galvanometer.

For a set of shunts so constructed, the total resistance required, if G = 5,000 ohms, is 5055·5 instead of 5667·637, *i.e.*, a saving of 612 ohms, or nearly $\frac{1}{8}$th the total resistance, consequently the size of the shunt box is reduced. There is one less coil to be adjusted; and, moreover, the principle on which the several resistances are distributed is very clear, and readily understood by non-mathematicians. The workmanship is simple; and, although two plugs are used, this can present no inconvenience, as the two holes to be stoppered in any case are placed side by side, and the multiplying power of the shunt indicated as usual by $\frac{1}{10000}$, $\frac{1}{100}$, or $\frac{1}{10}$, being placed between them. Thus, for the $\frac{1}{10}$th shunt, plugs are inserted in 5 and 6; for the $\frac{1}{100}$th shunt, in 3 and 4; and for the $\frac{1}{1000}$th shunt in 1 and 2. When the two plugs are in g, and g^1, the whole current passes through the short circuit; but, if g be removed, the current passes direct through the galvanometer. Besides, the plug inserted at g^1, 2, 4, or 6, as the case may be, will not unfrequently be found useful as an improvised galvanometer key.

For any other galvanometer, G, the resistances a, b, c, d, d^1, will of course bear the same proportion to that of the galvanometer, as in the example under consideration, viz. :—

$$a = \frac{G}{999};$$

$$b = \frac{G}{109{\cdot}89}; \qquad d = \frac{G}{1{\cdot}125};$$

$$c = \frac{G}{9{\cdot}900}; \qquad d^1 = \frac{G}{90};$$

and if S, S_1, and S_2, represent the resistance of the $\frac{1}{1000}$th, $\frac{1}{100}$th, and $\frac{1}{10}$th shunt respectively,

$$S = \frac{G}{999} = a;$$

$$S_1 = \frac{G}{99} = a + b;$$

$$\text{and } S_2 = \frac{G}{9} = a + b + c$$

EDISON'S NEW ELECTRIC LAMP.

MR. EDISON appears to be steadily working out the electric light problem he has set himself. A correspondent of the *Daily News* writes to that paper that he has witnessed the first practical exhibition of Mr. Edison's system of division. From his correspondence we gather that Mr. Edison has discovered a new alloy, the fusing point of which is much higher than either platinum or iridium, in fact, than any known metal. "This discovery is spoken of by some of Mr. Edison's chief *employés* as the greatest achievement of his life. This alloy also reduces the cost of the valuable metals used in each lamp to such a point as to do away entirely with Professor Tyndall's criticism. It has not only reduced the cost but has increased the illuminating power so that six lights are now obtained per horse-power where only four were possible with the pure platinum coil. Six lights per horse-power is the number authoritatively stated, but Mr. Edison's chief assistant does not hesitate to predict that eleven lights will eventually be obtained for each horse-power. This is not expected from the Gramme machine, however, which is now used; but is hoped for after the completion of the new generator, which a dozen of the most skilled workmen at Menlo Park are now engaged in constructing."

Further on in speaking of the lamp, he says: "It is in reality the idea of the quadruplex telegraph applied to heat instead of electricity. The expansion of the tiny key, or, more technically, switch, breaks the current for the fraction of a second, and permits the actual, though imperceptible, cooling of the incandescent coil. This connection is made and broken many times during each second; so that to human eyes the light is constant as the sun. Now we put it out and look at the lamp again. The small coil of amalgamated wire in the little glass chamber has resumed its gray leaden hue. But we make a discovery now, at least a surprise for us, for the scientific experts of the party know of its existence. The little coil of wire is hermetically sealed in the glass chamber. It is not in a vacuum, but the chamber is filled with air. There is a sensitive spot on the metal cap in which the glass tube sits, and the expansion of the air manipulates the switch. The heat of the metal itself, therefore, is no longer relied on. The inventor explains that, after all manner of severe tests, this has been found the easiest and the least easily deranged manner of controlling the light. The difficulty of making thin plates of metal of equal density and weight rendered the previous method impracticable for small lights, although it will probably be the best form in which to secure the desired result where the lamps are to show lights of great intensity. * * *"

"The most curious and interesting feature about the light will be its cheapness and the novel method of making the charge. The price will be regulated by the number of burners in each house, and the annual rate (which it is believed will afford a large profit) has been estimated at one dollar (4s.) per year for each burner. The machinery will be run day and night, and the light may be "burned" from one year's end to another without extra charge. In a twelve-room house the present average charge for gas during the winter season is 15 dols. to 18 dols. (£3 to £3 12s.) per month. One electric light, of an average 18-candle power, would certainly prove amply sufficient for each room (excepting, perhaps, the drawing-rooms), and would cost not 12 dols. per month, but 12 dols. per year! It is more than likely that this figure is too low, as the fluctuating price of coal and many incidental expenses in operating the machinery will have to be taken into account in making the estimate, but the price will certainly be one-third or one-fourth the cost of gas after the system is perfected."

FULLER'S ELECTRIC LIGHT.

AN improved induction apparatus, for lighting by electricity, invented by the late J. B. Fuller, of Brooklyn, N. Y., is shown in perspective by fig. 1, and in section by fig. 2. The inventor's aim in the construction of this apparatus is to operate along the main electric circuit a large number of small lights, each being placed in a local circuit, whose currents are induced by the currents of the main circuit. Two magnet cores are arranged parallel

Fig. 1.

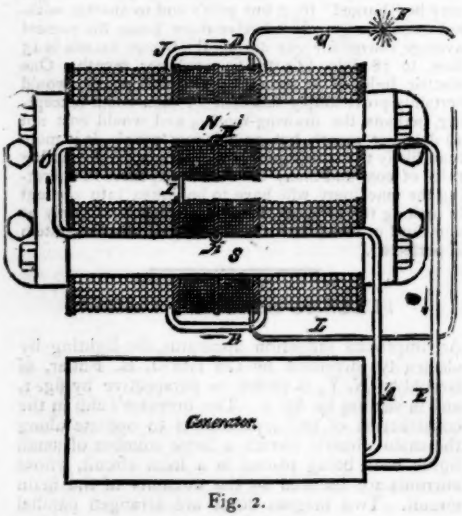


Fig. 2.

with each other, and connected magnetically at the ends, as shown in fig. 2. Around the centre of each of these cores is a soft iron head, and at a short distance from each side of this is a head of insulating material. The outer ends of the cores are coiled with insulated copper wire, and so connected together and to the electric generator as to produce, when in action, two consequent opposite magnetic poles, at N and S. A, B, C, D, and E, represent the connections of these coils. Between the iron heads and these coils are wound smaller coils of insulated wire, the fineness of which depends upon the tension of the current required.

There is an iron arm hinged to one of the iron heads, so as to swing over upon the seat connecting magnetically the poles, N and S, as shown in fig. 1. Now, if electric currents be sent through the main circuit, flowing around the large coils, and rapidly changing, in alternately opposite directions, the magnet cores will as rapidly change polarity, and these changes will induce in the small coils electric currents of greater or less tension, according to the fineness of the wire composing the small coils.

In the circuit of each of the small coils may be placed a lamp F, of minimum illuminating capacity. Two small coils may be connected together, parallel or in series, for producing a light of medium capacity; or four small coils may be connected, for producing one light of maximum capacity, as shown in fig. 2.

These connections for producing any changes in the circuits are made by means of ordinary switches, plugs, or keys. The arm which extends across the face of the coil in fig. 1, acts as a governor of the light, by strengthening or weakening the magnetic poles, and thereby varying the strength of the current.

Any number of such apparatus which the electro-motive force of the generator will supply may be arranged along the line of a conductor, the large coils being included in the circuit, and, by means of a switch in the local circuits, each or any lamp may be lighted or extinguished independently from the others.

INDUCTION APPARATUS FOR REVERSED CURRENTS.

By PROFS. ELIHU THOMSON and EDWIN J. HOUSTON.

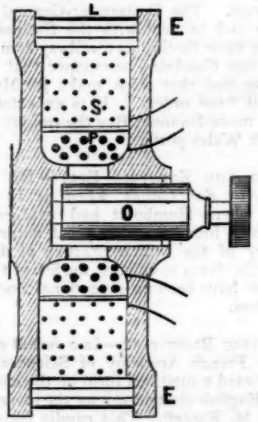
THE following apparatus was devised by the authors for the purpose of obtaining induced reversed currents for use in electric illumination. These currents we use with a vibrating lamp, somewhat similar in construction to a lamp, a description of which has already been published.

Our method of operation is as follows: — A reversed primary current is caused to induce reversed secondary coils provided therefor. These secondary currents are caused to give vibrations to carbon electrodes, and thereby at the same time produce a partial arc between them. With sufficient strength of primary current, a considerable number of secondary currents are obtained, each of which is able to operate one of our vibrating lamps.

The use of a vibrating lamp admits of a wide range in the size of the carbons employed. When

a light of very moderate intensity is desired, the carbons are made of very small size, and are placed in a closed glass vessel for protection from the atmosphere. To moderate the brilliancy, opalescent glass is used.

To obtain the highest efficiency of inductive action from a set of primary coils, the following form of induction of coil was devised: The primary coil P,



surrounding the core O, is provided with a secondary coil S, adjacent to it. The ends E, E, of the bobbin, are of made discs of iron concentric with the core O, and are slit from centre to circumference. The outer extremities of these discs are connected by wires or sheets of iron L, to one another, forming, in this manner, an induction coil encased in iron, or one whose core has its north and south extremities magnetically connected. The strength of the current developed in the secondary coil is greatest when the core O, which is movable, is inserted so that both of its extremities are in contact with E, E. By withdrawing this core, the currents in the secondary coil may be weakened to almost any desired extent. This coil is adapted to the use of primary currents whose direction is constantly changing. All the wire being completly surrounded by iron whose direction of magnetic polarization is rapidly changed, the highest inductive effect is thereby produced in the secondary coil.

The variations in the intensity of the induced currents will, of course, be followed by variations in the intensity of the light emitted by the lamp. The movement of the core may, therefore, be made to increase or decrease the intensity of the light.

Correspondence.

[We do not hold ourselves responsible for the opinions of our correspondents.]

CLERAC'S TUBE.

To the Editor of THE TELEGRAPHIC JOURNAL.

March 27, 1879.

SIR,—Referring to your leading article in the TELEGRAPHIC JOURNAL for March 15th, regarding the Clerac tube controversy, you mention in that connection that I succeeded in getting great range of resistance in my carbon rheostat. If you will read carefully the full description of the instrument in question you will find that it is made up of several hundred discs of silk, with plumbago worked through the pores, and it is only by this laborious process that any great range of resistance is obtained. Had I merely used powdered carbon, as in the Clerac tube, it would have been a failure.

Regarding the microphone, and your remarks pertaining thereto, as set forth in your review of "The Speaking Telephone, Electric Light, and other recent Electrical Inventions," by Geo. B. Prescott, allow me to say that I have over fifteen drawings taken from different periodicals, a number having been clipped from the pages of the *Mechanics' Magazine*, of microphones made by different amateurs, four of which are identical with the carbon telephone, and the others bearing a great resemblance to it. It is known and is susceptible of proof that the ordinary carbon telephone may be adjusted to any degree of delicacy, and when so adjusted is as sensitive as the so-called microphone.

This being the case, I should like to have it shown at what point in the adjustment does it cease to be a carbon telephone and become a microphone?

Truly yours,

THOMAS A. EDISON.

[If you will carefully read our leader again you will see that it was to your Pressure Relay as described in the *Journal of the Telegraph* for June 1, 1877, that we alluded, and not to your recent Carbon Rheostat, which is a different instrument, and composed as you have stated. You will remark also that we only *quote* the statement that you succeeded in getting a great range of resistance in carbon by pressure. "He" (meaning yourself), says the *Journal of the Telegraph* article, "takes advantage of the property which plumbago possesses of decreasing its resistance enormously under pressure;" and the plumbago referred to is further described as being in the shape of solid discs placed upon the cupped poles of an electro-magnet, and not as powder rubbed into the pores of silk. The change of carbon resistance under the pressure of the relay armature is also given as from several hundred to several ohms. The article in question is evidently an emanation from Mr. Prescott, and has been accepted, until now, as authorised by yourself. But if it is erroneous we are glad to be told so. We greatly prefer your facts to Mr. Prescott's writings.

In the second part of your letter we note a similar disagreement between your results and Mr. Prescott's descriptions of them. Mr. Prescott tells us that "it is not probable that faint sounds were ever augmented through their (the microphones') agency, so that they could be easily recognised at a distance from their source," he doubts in short that there is any such thing as a microphone, although certain instruments have been called so.

You on the other hand affirm that your carbon telephone can be adjusted so as to become a microphone. Here again we take your word for this interesting fact; but in common fairness we must not forget, at the same time, that these new powers of the carbon telephone have been discovered since Professor Hughes published his researches on the microphone. As for Mr. Prescott, we recommend to his perusal an article in our last issue by Col. Navez, in which the distinctive features of a microphone are ably set forth. We are glad that you have addressed us personally on this matter, for your own communications are always courteously expressed and pointedly clear.—ED. TEL. JOUR.]

WE understand that the Town Council of Hadleigh, Staff., intend to light a large square in their town by the electric light.

Notes.

THE ELECTRIC LIGHT.—Messrs. Breguet and Co., Paris, are supplying Jablochkoff candles for laboratory use, lectures, &c., at 75 centimes apiece.

THE British Electric Light Company experimentally lit the Edgware Road Station of the Metropolitan Railway on April 3, with a single light fed by a small Gramme machine, and suitably diffused by a reflector.

UNDER the title of the "New Parisian Electric Pipe Lights," small brass boxes containing rodlets of metallic sodium, to be kindled into flame by the saliva, are being sold at 1d. each on the London streets. The risk to person and property entailed by the indiscriminate use of this dangerous chemical is timely indicated by the *Sanitary Record*.

IT is expected that, as the inquiry on the subject will be extended, no Parliamentary powers for electric lighting will be granted this session.

THE MICROTELEPHONE is the name given by its inventor, Herr Julian Ockovowicz, of Lemberg University, Galicia, to a Bell telephone in which the current generated by the vibration of the diaphragm is caused to pass through the diaphragm and core as well as the coil before it enters the line. "The communication of the current with the vibrating plate," says the inventor in a letter to *Nature*, "is effected by means of two small springs which are lightly pressed by the membrane," which act as a weak microphonic contact. Three millimetres above the iron diaphragm there is a membrane of caoutchouc, so that the two enclose a film of air between. With this instrument, which is adjusted once for all, the feeblest word may be transmitted.

SYNCHRONOUS ELECTRIC CLOCKS. — Messrs. J. Edmundson & Co., of 19, George Street, Westminster, have imported a novel system of synchronising all the clocks of a hotel, railway station, or other large establishment, with one good standard clock, by means of electricity. The system may be applied very successfully to church and turret clocks, a small standard working a large dial at any distance, and we understand that it has recently been applied to the clock of St. James's, Piccadilly. At the Paris Exhibition a dial 20 feet in diameter was worked by this plan, and a medal gained. The advantage of an electrically synchronised clock is that it admits of one long seconds pendulum regulating a number of clocks with short pendulums; but it may also have its disadvantage in encouraging bad clockmaking.

MESSRS. SAMPSON, LOW, AND CO. are about to publish Mr. J. E. H. Gordon's recent lectures on Electric Induction.

WE have received the *Science Index*, a monthly alphabetical guide to the contents of scientific periodicals, edited by Mr. A. Hildebrandt, A.I.C.E., and published at Bow Chambers, Cross Street, Manchester. This is a periodical for which the time is quite ripe, and we trust it will meet with every encouragement.

THE SWANSEA BAY TELEGRAPH STATION. — The trade of the Bristol Channel has for some time past suffered from there being no means of communication between shipowner and ship on arrival of the latter in the Channel and before her entry into port. It will be remembered that an attempt to lay a cable between the coast of Devonshire and Lundy Island was recently foiled by the owner of the island, a Mr. Heaven, refusing to allow a cable to be landed on it. The principal merchants and shipowners of Swansea thereupon drew up a requisition for appointing a telegraph station at Mumbles Head, and presented it to the Harbour Trust. The Postmaster-General agreed to erect a wire and to deal with the Swansea Harbour Trust on the same footing as a railway company. We learn from the *Cambrian* newspaper that the line is now working, and that ships make for Mumbles as a place of call "for orders." It is expected that this project will make Swansea Bay the freight market for all the South Wales ports.

CATCHING THE ELECTRIC EEL. — Dr. Sachs, the author of *Aus der Llanos*, when at El Rastro, in Venezuela, where Humboldt had captured *gymnoti* 76 years before, found that the great naturalist's well-known story of the Indian practice of driving wild horses into the rivers to exhaust the fish of their electric charges must have been an exceptional one, and not a regular custom.

AN ELECTRIC BLOW-PIPE.—In a recent communication to the French Academy of Sciences, M. Jamin brought forward a modified form of the electric candle familiar to English electricians as the invention of Mr. Wilde and M. Rapieff. This candle consists of two upright carbon rods side by side, as in Jablochkoff's candle, but without any other insulator between them

except the air, and the arc is driven to the tip of the candle by the electro-dynamic action of the current on itself. M. Jamin multiplies this action by winding one of the electrodes round the candle as shown in the accompanying figure, where A B and A' B' are the carbon rods, and C D E F is the electrode coiled in turns round the candle, so as to keep the direction of the current according to the arrows. When the action of the rectangle of wire on the arc is sufficient, the arc A A' lengthens out and flares up like a gas-flame towards the attracting current from D to E. M. Jamin allows it to play upon a piece of lime, or magnesia, or zirconium, like the oxyhydrogen flame in the Drummond lamp. This has the effect of trebling the amount

of light given off, and toning its quality from violet to yellowish green or white by admixture of the green rays from the chalk. The heat of the arc is so intense as even to fuse the chalk, and hence M. Jamin recommends the arc to chemists as perhaps the most powerful blow-flame known. The multiplying effect introduced by M. Jamin appears to us to be the chief novelty in this candle, for, if we mistake not, M. Rapieff has also applied chalk to the arc in the manner described.

A LIQUID CURRENT INTERRUPTER.—Mr. Sergius Kern sends us an account of a very interesting experiment by M. Slouginoff, which is likely to be fruitful in research. He takes the two electrodes of a battery, one of which is a thin, plain platinum plate placed horizontally, and the other is a platinum wire placed perpendicularly to the plate, and nearly in contact with it. A small quantity of water, acidulated with sulphuric acid, is next poured on to the plate. If a current from 8 to 12 elements passes through the apparatus, and the wire is made the cathode, a spot of light is observed on its point. When using 15 elements the light appears, even if the direction of the current is changed. During these phenomena the water is only slightly decomposed, and the needle of a galvanometer, if introduced into the circuit, is only slightly deflected. It was also remarked that the water under the wire is lowered, forming the shape of a cup. The bubbles of gas, arising from the decomposition of the water, in this case travel constantly round the wire, forming a very pretty figure 8. This is caused by the movements of the surface of the water, it being alternately repelled or attracted to the wire carrying the current. * * * In employing a current of 12 elements, and introducing into it Slouginoff's apparatus, a distinct sound is remarked. If the platinum plate is well polished, the water is repelled from the point of the wire equally in all directions, and some millimetres from it. The current is thereby interrupted, and the liquid advances to the wire; in this case the liquid will be again repulsed, and so on.—Crooke's *Monthly Journal of Science*.

BLACKMER'S ELECTRICAL SIGN.—The aid of electricity for rendering advertising signs more striking, has been called in by Mr. J. L. Blackmer of Boston, U.S., and his plan has been so successful that it is now patented in England. (Patent, No. 3,750, 1878.) The sign-board used by him is usually a sheet of zinc, painted or gilded, as the case may be, and the letters of the advertisement are stencilled out by punched holes. In these holes, however, are hung glass lenses or bright discs of metal, which will either transmit light from behind, or reflect it from in front. Now, such a sign would not outvie the other crystal or brilliant ones in vogue; hence Mr. Blackmer employs a small vibrating electro-magnetic apparatus to shake the sign, so that all its pendants will dangle to and fro, and scatter their glittering light.

EUROPEAN TELEGRAPH LINES.—In 1877 Russia had 94,339 kilometres of line, France 57,110, Germany 54,356, England 40,387, comprising for Russia 187,525 kilos. of wire, for France 150,506, for Germany 187,470, and for England 174,533 kilos. Switzerland counts 1 telegraph station to every 28·32 square kilos., Belgium 1 to 46·3, England 1 to 59·24, Russia 1 to 10·034. In Switzerland there are for every 1,000 inhabitants 989 telegrams, England 651, Holland 629, Belgium 544, Russia 58.

NICKEL compass needles are being tried in the French and Russian navies.

MUIRHEAD AND WINTER'S Quadruplex system is working successfully between Madras and Bombay. It is to be hoped that this novel system will be fairly tried upon our own inland lines.

NEW ZEALAND TELEGRAPHS.—We learn from *Engineering* that Mr. L. Maling, telegraph surveyor, has been ordered to construct a line to connect Dargaville and other places on the Kaipara with the system of New Zealand. The line will start from Waipu, and will be 53 miles long.

WE learn from the *Journal of the Telegraph* that Gen. Eckert has resigned the presidency of the Atlantic and Pacific Telegraph Company. His position had become a sinecure; and it is thought that he will join the proposed new telegraph combination of Railway Companies opposed to the Western Union Company.

EDISON'S Biography is being written by Counsellor Edwin M. Fox, of New York, an intimate friend of the inventor.

IN the United States Circuit Court in New York, on Saturday, March 1st, Judge Blatchford rendered a decision in the application of Clinton G. Colgate against the New York Central and Hudson River Railroad Company to restrain them from using his gutta-percha patent insulators on their cables and telegraph wires. It was stipulated by counsel that thirty days should be allowed the company in which to substitute kerite for gutta-percha on their wires. The judge granted a preliminary injunction pursuant to the bill and stipulation, and says that the question as to whether kerite is an infringement on gutta-percha as an insulator is not passed upon in this decision.—*The Operator*.

THE "Silver Wedding" of the Old and New Worlds, as the American papers call the recent banquet in honour of Cyrus W. Field, on the occasion of the twenty-fifth anniversary of the formation of the first Atlantic Ocean Cable Company, passed off very harmoniously.

THE SPECTRUM OF A GAS.—From experiments made by passing induction currents from *liquid* electrodes through Geissler tubes, Herr Paalzou is led to doubt whether a plurality of spectra is to be obtained from the same gas under different conditions of pressure and temperature.

THE AURORA.—The following observations were made at Annanatook, on the West Coast of Cumberland Gulf (lat. 66° 13′ 45″ N., long. 67° 18′ 39″ W.), by the American Howgate Arctic Expedition. The most brilliant auroras were seen in January and April. The colours observed were usually pale blue, sometimes very pale green, rarely straw yellow, and once only rose at the base. The light from the aurora was sufficient to guide the traveller in his path. It occasionally affected the ordinary compass needle, as on the 29th August when the ship's compasses could not be used while the auroral display lasted.—*North American Review*.

THE ELECTRIC DISCHARGE.—A sealed packet, deposited by M. Planté with the French Academy of Sciences on June 11, 1877, has been opened by that body and found to contain the author's researches on currents of high tension. These studies tend to prove,

in the author's view, that the electric discharge consists of a movement or transport of a very small quantity of ponderable matter at a very high velocity.

THE Bordin Prize, which was offered by the French Academy of Sciences for "a discussion of the recent formulæ which have been proposed to replace Ampere's law of the mutual action of two current elements, and the reasons in favour of any one of these over the others," has not been fully awarded. One sealed essay was sent in which gave preference to the formulæ of M. Reynard, but which did not treat the subject completely. The judges, however, awarded a recompense of 2,000 francs to the author, who proved to be M. Reynard himself.

THE Rotation of the Plane of Polarised Light in Gases has just been effected by two German experimenters, MM. Kundt and Röntgeu, with the aid of powerful electro-magnets, made by passing the current from 64 Bunsen cells through six coils of thick wire (each comprising 400 turns) surrounding a tubular iron core. They shewed that saturated vapour of carbon bisulphide at 100° C. rotates the plane of polarisation of light in the magnetic field produced by this electro-magnet.

MAGNETO-INDUCTION CURRENTS.—According to the recent researches of Count du Moncel, if an iron stem or core wound with a coil be shifted in the direction of its axis in front of a magnetic pole, a series of induced currents in the same direction will be produced, succeeding each other, whilst the movement lasts, that is from end to end of the stem; but this effect will not manifest itself, without a special disposition of the coil upon a ring entirely enveloped by the coil, for, in this case the two opposite parts of the ring are oppositely polarised under the influence of a single inducing pole, and as the coil is wound in a different direction in relation to the two resultants corresponding to the neutral lines, the induced currents produced would be equal and contrary. For this reason M. Gramme has been obliged to divide the helix of his ring into sections, and to connect them in circuit by a collector. M. du Moncel also remarks that the induced currents in the Gramme machine are made up (1), of those which result from the movement of the coils induced before the conductor; (2) by those which are determined by the interversions of polarity of the iron ring; but the effects are the same as if those helices displaced themselves upon a fixed ring, having determinals and constant polarities.

ELECTROTYPING ON PORCELAIN.—This is now done in France with beautiful effect. The conducting basis is formed by dissolving sulphur in oil of lavender to a syrupy consistence, and mixing it under a gentle heat with chloride of gold or chloride of platinum dissolved in sulphuric ether. This mixture is evaporated to a cream, and painted on the article as a basis for the electro-deposit.

TRANSMISSION OF POWER BY ELECTRICITY.—Profs. Houston and Thomson have experimentally shewn at the Franklin Institute that powerful electric currents can be conducted by very fine wires. They sent the current generated by one dynamo-electric machine through a wire ·004 inch in diameter to a second machine, which, working reversely, gave off considerable power.

A REGULATOR FOR JABLOCHKOFF'S CANDLE.—The Abbé Lavaud has devised a simple plan for keeping the tip of a Jablochkoff candle at the same height. A small platform, which carries the candle, is floated over mercury by means of two long rods projecting from the underside of the platform and dipping into two cylinders of mercury. Each rod carries a wooden float at its lower extremity immersed in the mercury. A third rod between these two moves vertically in a central column and acts as a guide to the up and down motion of the other floats. When the candle burns down its diminished weight causes the floats to rise in the mercury and raise the platform which they carry until the point of the candle reaches its old position.

SENOR CAPPANERA, who has already translated Jenkins's "Electricity" and "Culley's Telegraphy," is now at work on "Sprague's Manual."

MAGNETISATION OF NICKEL.—According to M. Henri Becquerel, in the *Comptes Rendus* for Jan. 20, bars of nickel become saturated with magnetism much more promptly than iron bars, and hence are better suited for temporary magnetisation—a fact which might be useful in telegraphy. Cobalt gives results similar to nickel.

MAGNETISM AND CLOUDS.—The auroral or magnetic cirrus is the name given to a species of symmetrical cirrus often seen during auroral displays, and the Rev. Samuel Barber, in the latest *Quarterly Journal of the Meteorological Society*, argues that they are caused by the magnetic action of the earth or by atmospheric electricity. Cloud forms would seem to exist in the air at all times in an invisible state until a certain degree of condensation from the effect of external force is attained. Magnetic or electric disturbances are probably forces with this power. Mr. Barber was led to this conclusion by observing an ordinary lunar halo, seen through cirrus clouds (of the kind popularly known as Noah's Ark), on the night of Oct. 23rd, 1877, to change its form under the influence of the luminous waves of an aurora.

THE PATENTS BILL.—The Attorney-General's Patents for Inventions Bill proposes the following among other changes in the law:—Additional unpaid commissioners; extension of provisional protection to 12 months; publication of complete specification three months at least before end of provisional protection; only opposed cases referred to law officer; appeal by petition to Lord Chancellor against law officer's report; any person may oppose sealing; extension of term to 21 years, power of prolongation by Judicial Committee being abolished by repeal by bill; relief on accident, mistake, or inadvertence preventing payment in due time of periodical stamp duty; large power of amendment before and after sealing; improved procedure as to disclaimers and alterations; binding of Crown, with power for contractors to use, on terms compulsory use or licensing; abolition of *scire facias*; abolition of communications from abroad, and regulation of patents for imported inventions; power for law officer to take evidence on oath; power for Lord Chancellor to appoint judge of High Court to hear patents petitions; proper particulars of objections or of breaches required in all cases; patent museum provided for; lower stamps—first cost of patent will usually be £17 10s., or if no amendment before sealing £12 10s., instead of £25; patents will not extend to the colonies, which now have their own systems; the twelfth year is taken, instead of the fourteenth, for payment of the last stamp fee, in order that the public may have long notice of the patentee's intention to renew beyond the fourteen years. It will no longer be necessary for the patentee, on renewing, to produce the letters patent themselves or a duplicate thereof; the stamp will be put on the certificate of renewal, which will be issued at the Commissioner's Office.

"KERITE" CORE.—According to the advertisement of its inventor, the kerite or artificial caoutchouc core of Mr. A. G. Day, of New York, is not injuriously affected by extremes of heat and cold experienced in any climate, nor by length of exposure in the atmosphere. It will endure long continued heat below 200° Fah., and for short intervals as high as 250° to 300° Fah.; and it may be safely immersed in boiling water. Salt or fresh water improves its insulation. It is uninjured by the roots of plants which soon destroy gutta-percha. Acids act very slowly, and only superficially upon it; while hot strong alkalies have no effect on it. Mineral oils and illuminating gas as far as is known do not deteriorate it. Samples of kerite core have been laid for a long period in the Carribbean Sea, yet the "teredo" which would have speedily destroyed other cables thus exposed, has left these entirely unharmed. Experimental lines on the Isthmus of Panama, have also been exempt from the ravages of the white ant, which makes short work of wooden poles. Kerite core is used almost exclusively by the U. S. navy department in the torpedo experiments they have been carrying on during the last three years, and it appears to have been in use in different cities of the American continent, in Egypt, and Canada for some years. Diplomas of excellence were awarded to the makers for the excellence of its insulation and durability at both the late Philadelphia and Paris Exhibitions. After this long catalogue of the virtues of kerite, it would be instructive also to know what are the weak points in it, for doubtless there will be some. The insulation resistance is probably much lower than either gutta-percha or india-rubber.

LUMINOUS DIALS.—M. Recordon, a Parisian clock manufacturer, makes known the fact that for two years he has constructed watches and clocks with luminous faces on a plan, patented by him, which does not involve the use of phosphorescent substances. It consists in passing an electric discharge through a Geissler tube filled with a gas which yields a bright light. For watches the battery, one of Trouvé's thimble forms, is, together with a small induction coil, hung at the watch chain. Pressing a spring completes the circuit and illuminates the dial.

FLAME LIGHTNING.—A flash of lightning resembling a colossal candle flame, based on the horizon and surrounded by a fainter aureole, was recently observed in the province of Rio Janeiro, Brazil.

New Patents—1879.

1175. "Electric candles." J. IMRAY. (Communicated by the Societe Generale de l'Electricite.) Dated March 24.

1181. "Iron telegraph posts. F. C. GLASER. (Communicated by J. Rauch.) Dated March 25.

1203. "Machinery for coating the surface of wax or other moulds with black lead for electrotyping." E. A. CLOWES and J. BATEY. Dated March 26.

1207. "An improved method of and apparatus for producing electric lights, whereby such lights can be more conveniently distributed and economically maintained in public places and private houses." T. A. DILLON. Dated March 26.

1229. "Improvements in apparatus for raising ships' anchors, telegraph cables, and other submerged property, such improved apparatus being also applicable to other purposes." H. W. HEMSWORTH. Dated March 28.

1242. "Electric telegraphs." E. A. COWPER. Dated March 28.

1347. "An improved means of and apparatus for transmitting messages, handwritings, and printed matter by electrical cables or wires over land or beneath the sea." T. A. DILLON. Dated April 4.

1374. "Electric batteries applicable to telegraphic and other purposes." T. J. HOWELL. Dated March 14.

1383. "Improvements in electric telegraph apparatus for transmitting orders on board ship and for other purposes." J. PITKIN. Dated April 7.

1387. "Improvements in dynamo and magneto-electric machines for generating electric currents to produce light or illumination and for electro-plating and for other purposes useful in the arts including improvements in machines or apparatus and in means, modes, and processes connected therewith." A. W. LAKE (communicated by N. S. Keith). Dated April 8.

1397. "Improvements in or preparatory to electro-plating." H. KRUPP. Dated April 8.

ABSTRACTS OF PUBLISHED SPECIFICATIONS—1878.

2816. "Magnetising metal or other substances, &c." G. E. PRITCHETT. Dated July 13. 6d. Magnets are formed into hollow resonating chambers and united with microphones so as to give strong telephonic effects.

3317. "Galvanometers." E. A. OBACH. Dated August 22. 2d. This consists in forming galvanometers suitable for measuring currents of diverse strengths, by mounting the coil on a frame so that its obliquity with respect to the needle may be varied. *(Not proceeded with.)*

3367. "Galvanic batteries." J. C. FULLER and F. H. W. HIGGINS. Dated August 26. 2d. This describes the use of an amalgamated surface of iron, immersed in amalgam, instead of the zinc pole in a battery. *(Not proceeded with.)*

3428. "Ship telegraphs." J. S. GISBORNE. Dated August 30. 6d. Two order dials are electrically connected, and, by a step by step action, the hand on the receiving dial is made to show the position of that on the transmitting dial.

3528. "Magnetic appliances of garments." W. WILSON. Dated Sept. 6. 2d. This relates to improvements in magnetic belts, spinal bands, &c., whereby "dry" electric currents are kept circulating at the same time as magnetic currents. *(Not proceeded with.)*

Proceedings of Societies.

THE INSTITUTION OF CIVIL ENGINEERS.

AT the meeting on the 25th of March, Mr. Bateman, President, in the chair, the Paper read was on "The Electric Light applied to Lighthouse Illumination," by Mr. J. N. Douglass, M. Inst. C.E.

The author showed the progress of lighthouse luminaries from wood and coal fires to the introduction

of tallow candles, fatty oils, mineral oils, coal gas and electricity. In 1839 experiments were made by Faraday, for the Trinity House, at the Orford Low Lighthouse, with the Bude light, and in 1862, at the South Foreland with the Drummond or lime light, but the results were not so satisfactory as to lead to their adoption. In 1857 experiments were tried at Blackwall with the electric light, produced by the first magneto-electric machine of Holmes; and on the 8th of December, 1858, the electric light, obtained by Holmes' second machine and a "Duboscq" lamp, was shewn on the sea for the first time from the South Foreland High Lighthouse.

On the 1st of February, 1862, the Trinity House exhibited the electric light permanently at Dungeness Lighthouse, by Holmes' magneto-electric machines and lamps. The works for the production of the light were described, and the first cost and maintenance given. The intensity of the electric luminary was about 12½ times that of the oil luminary. The cost per unit of light per hour was 0·1165d. for the oil, and 0·1294d. for the electric light. Frequent falling off of the latter light occurred, and the oil light had occasionally to be substituted. Shortly afterwards the French lighthouse authorities established the electric light at Cape La Hêve, with the magneto-electric machines of the Alliance Company of Paris. In 1867, Holmes further improved his machine and lamp. Two of these machines and lamps were exhibited by the Trinity House at the Paris Exhibition of 1867, with a dioptric apparatus of the third order. The Souter Point Lighthouse was lighted by electricity in January, 1871. The light was adapted to a dioptric apparatus of the third order. A lower light from the same luminary as the upper one was adopted here for the first time. The optical apparatus for both lights was designed by Mr. James T. Chance, M.A., Assoc. Inst. C.E. A "Holmes" fog trumpet apparatus was also worked from the same engines as the electric light apparatus. The total cost of the works was £18,000. The cost of the electric luminary per candle per hour was 0·056d., being rather less than half of the cost per unit at Dungeness. The maximum intensity of the beam from this apparatus was about 700,000 candles. The Trinity House next established the electric light at the South Foreland High and Low Lighthouses, in January, 1872. The apparatus for the production of the light consisted of two steam engines of 20 effective H.P., four Holmes' improved magneto-electric machines and lamps, and two dioptric apparatuses of the third order for fixed white light. The cost of the additional works for these lights was £14,800. The intensity of the full power beam from the High Lighthouse was about 20 times that of the old first order dioptric oil light. The relative cost per unit of light was as 100 oil to 30·6 electric. In 1873, the Trinity House adopted, for the Lizard Lighthouses, Siemens' dynamo-electric machine and lamp, and a siren fog signal. These were driven by three of Brown's caloric engines, each of 10 effective H.P. The cost of the additional works for these lights was £14,936, and the annual maintenance, including interest on first cost amounted to £2,365 6s. 4d. against £1,016 7s. 11d. for the oil lights. The intensity for the full power beam of each light was about 330,000 candles, being about 211½ times the intensity of the oil light. The relative cost per unit of light was 100 oil to 14·04 electric. The successive improvements in the electric machines, and in the means of driving them, had reduced the cost of the electric light at the Lizard to one-ninth of that at Dungeness, and the quantity of light produced at the Lizard per pound of coke consumed was increased 20 times.

The continued growth seaward of the shingle point at Dungeness led to the removal, in 1876, of the original electric light apparatus, and the substitution of a low flashing oil light and siren fog signal for both lighthouses.

The author furnished information received from M. Allard, Director-General of the French Lighthouses, relative to the electric lighthouses at Cape La Hêve and Cape Grisnez, where Alliance magneto-electric machines and Serrin lamps had been adopted. It was intended to exhibit the electric light in the present year in a new lighthouse on the Isle of Planier, opposite Marseilles, and it had been decided to substitute the electric light for the oil light in the Palmyre Lighthouse at the mouth of the Gironde. Some information was also given relative to the electric lighthouses at Odessa and Port Saïd, these making ten in which the electric light had already been established.

The comparative cost and efficiency were shewn of lighthouse luminaries produced by all the agents at present employed, viz.:—oil, coal gas, and electricity. Coal gas, on Wigham's System, was applied to the Howth Bailey Lighthouse, Dublin Bay, by the Commissioners of Irish Lights, in June, 1865, and it had since been extended to seven lighthouses on the coast of Ireland. In 1872, the Trinity House adopted it at the Haisborough High Lighthouse. The additional cost of the works necessary for the introduction of gas at this station, was £1,996, and the annual maintenance of the gas establishment, including interest on first cost, &c., amounted to £832 4s. 3d. This light had a mean intensity of 1,173 candles, and a maximum intensity for thick weather of about 2,923 candles. In 1877 the necessary additions were made for lighting the Low Lighthouse (distant 766 yards), by gas from the same works, at a cost of £1,296. The system of Mr. Wigham had been further developed by introducing the flames of two, three, and four large burners over each other in the axis of the dioptric apparatus. In January of last year, the Commissioners of Irish Lights adopted one of the latter lights in a new lighthouse at Galley Head, near Kinsale. The maximum intensity of the four burners combined for thick weather was about 5,012 candles. The author next gave statements, shewing the comparative focussing compactness of the lighthouse luminaries which had been referred to, for utilising in optical apparatus, viz., the lights produced by oil, coal gas, and electricity. The focusing superiority of the electric luminary, compared with the best of these, was as 616 to 1. Statements were given of the comparative average cost and annual maintenance of a single lighthouse (shore station) in this country, with colza oil, mineral oil, coal gas, and electricity, as the illuminating agents, both with and without a first class 20 H.P. siren fog signal. For a maximum degree of light equal to the single or combined intensity of the luminaries of the Lizard, the cost of the more perfect electric luminary per unit of light provided was about $\frac{1}{13}$ and $\frac{9}{13}$ respectively of that of coal gas, and about $\frac{1}{15}$ and $\frac{9}{15}$ respectively of that of mineral oil, at their maximum intensities. With higher intensities of the electric luminary the cost per unit would be more in its favour, no further addition to the working staff being necessary.

From experiments by Faraday for the Trinity House, in 1836, relative to the penetrative power of lights through such obstructions as fog, mist, &c., and the more recent experiments by the French Lighthouse Authorities and by the Trinity House, with oil and electric lights, it might be assumed that, with the atmosphere so impaired for the transmission of light, that the oil luminary at its maximum intensity would be fairly visible at the fog signal range of two miles, the electric luminary at its double Lizard intensity of 16,500 candles would be visible at about four miles.

Further, that on more frequent occasions, when the oil luminary would be visible at about 8½ miles, the electric light would be visible at the full range of 17 miles.

THE SOCIETY OF TELEGRAPH ENGINEERS.

AT the ordinary general meeting of the society held March 26th, Mr. W. H. Preece, Vice-President in the chair, a Paper by Mr. J. Sivewright, M.A., on "South African Telegraphs" was read by the secretary.

Describing the "route" taken by the wires, Mr. Sivewright stated that in many cases the line of poles instead of running by the side of the highways, was erected out of sight without apparent reason, this being particularly the case with the lines first erected in the colony. The crossing-places at rivers were injudiciously chosen in many cases, so that the lineman patrolling the lines often had to make a detour of several miles in order to cross. Mr. Sivewright pointed out that the crossings should only be made at fords even though the line had to take a somewhat circuitous route for the purpose. In cases where the line could not follow the highway the most direct route should be taken.

The selection of poles, whether they should be of wood or iron, must be entirely guided by circumstances. In many districts wood was not to be obtained except at a considerable cost for transit, in such cases iron poles could be used with advantage, their comparative lightness being in their favour. As a rule the wood which could be obtained was of an inferior quality and not durable; but where it was plentiful and repairs could be easily executed, this was not of great consequence. Boucherizing the timber was not found to be successful; Creosoting, although most effectual, was expensive, as creosote was difficult to obtain. The Eucalyptus was pronounced useless for poles. Olive wood, which could be obtained in some districts, was found very durable, no cases of decay at the ground-line with this wood being known. The most durable wood of all was the so-called "sneeze" wood, which, although difficult to obtain straight, was found to be practically indestructible, and it was largely used, although from its crooked growth the appearance of the lines was not picturesque.

Wooden poles were less liable to be knocked over by waggons running against them; but, on the other hand, iron poles were avoided by cattle.

As regards cost, it was stated that the iron poles first erected at the diamond fields cost 50s. each. At the present time the sneeze wood poles cost about 40s.

The wire used was almost universally of No. 6-gauge, No. 8 being occasionally employed. The wire was not found to decay. From its lightness, compound wire was recommended.

The cost of transport of the materials was excessively high, being sometimes as much as £15 10s. per ton for 50 miles, consequently lightness was extremely advisable.

At crossings, where the long whip lashes employed frequently caused contacts, No. 12 steel wire strained up tight was recommended. The form of strainer found to answer best was the "wedge." The "eccentric" strainer was a complete failure, seldom holding tight.

For fixing the insulators to the poles, *black* iron bolts were found far preferable to galvanised ones, as the latter were much more brittle. Every pole was provided with an earth wire for protection from lightning.

Bad joints were found to give great trouble from not being properly soldered. "Fletcher's" apparatus for soldering was found highly effective, paraffin oil being used as the fuel.

The insulators employed were of three kinds, viz.: "Oppenheimer's," "Andrews'," and "Siemens'" iron hooded form. Andrews' insulator was highly effective electrically. Brown ware double shed insulators were a complete failure, as thick fogs, which were frequent, lowered their insulation excessively. Oppenheimer's insulator was a good form, for the reason that the bolt was screwed and not cemented to the porcelain, and was therefore easily unscrewed when broken. In referring to this insulator, Mr. Sivewright recommended that an india-rubber ring should be used between the bolt and the porcelain.*

It was stated that great damage was done to insulators by lightning, especially on iron poles, though Siemens' form suffered less than the others.

The leading-in wires at the offices gave a great deal of trouble, as the great heat experienced melted the gutta-percha wires and caused faults.

With regard to "earths," the peculiar dryness of the soil rendered a good earth difficult to obtain. The rails of the railway were used where possible for the purpose. In some districts it was found necessary to have an iron pipe in the ground leading down to the earth plate, through which water could be poured every day to keep the earth around the plate moist.

In discussing the question of telegraphic communication with Europe, Mr. Sivewright strongly advocated a land line passing through Pretoria, Zambesi, and Zanzibar, a distance of 4,000 miles in all. The first 1,600 miles could, in Mr. Sivewright's opinion, be erected and maintained without difficulty, as the natives of the districts through which this portion of the line would pass were well-disposed and not troublesome, nor did the remaining length present insuperable obstacles.

In the discussion which followed the reading of the paper, Mr. MAYES, who has had a wide experience of the districts through which the line was to pass, expressed his opinion that the scheme was absolutely impracticable, as in central Africa the growth of vegetation was enormously rapid, and the maintenance of the line would consequently be almost an impossibility. The cost of transport would be very heavy; indeed, Mr. Mayes stated, that it was very questionable whether transport could be effected at all, as bullocks could not be kept alive, and sufficient coolie labour could not be obtained. The existence of malaria rendered the risk to the lives of Europeans very great.

Mr. FISCHER VON TREUENFELD stated that the queries raised by Mr. Sivewright at the commencement of this paper, with reference to the lines not following the highways, could be explained by the supposition that the roads were made after the construction of the lines. He also expressed his opinion that iron poles were superior to wooden ones, in that the cost and trouble of their maintenance would be small.

Mr. SARGEAUNT, who is Crown Agent for the Colonies, and who has had considerable experience of African travel, said, that although at first he doubted the feasibility of a Trans-African land line, he had since reason to alter his opinion on the subject; but although he considered that a land line would eventually be erected, he strongly urged the necessity of telegraphic communication with Europe being effected as early as possible, and this could only be done by means of a cable. Mr. Sargeaunt warmly eulogised Mr. Sivewright's services to the Cape Government in bringing the telegraphic communication into a high state of efficiency.

Major WEBBER pointed out that the telegraph had been of great use during the Caffre war of 1878, but stated that the material at present available at the Cape was too heavy for military use. At the present time

* This has been done by Mr. Cordeaux in his Patent Insulat . See TELEGRAPHIC JOURNAL, Vol. VI., p. 286.

there were being sent out to the Cape for the latter purpose 100 miles of line, 30 miles being ground cable, 20 miles light wire with poles, and the rest wire only; wheel transport was also being provided, but Major Webber thought that pack animals would be the most advantageous form of transport.

Mr. SPAGNOLETTI suggested kyanizing as a good method of preserving timber for poles, stating that timber so prepared had been known to last for 30 years. He also drew attention to a new form of insulator of Mr. Oppenheimer, which was intended to act as a lightning guard. The bolt in this insulator was carried nearly up to the top of the porcelain, and was pointed.*

A vote of thanks having been proposed to Mr. Sivewright for his paper, the discussion was then adjourned till the next meeting.

AT the ordinary general meeting held April 9th, Major Bateman-Champain, President, in the chair, the adjourned discussion on Mr. Sivewright's paper on "South African Telegraphs" was continued.

Mr. A. BELL drew attention to a new form of insulator as likely to be of service for use in the Colonies. In this insulator the wire was secured by having an ingot of metal cast on it, the wire fitting in a groove at the top of the insulator and being secured by an iron pin passing through holes in the porcelain. The form of insulator Mr. Bell stated would be very effectual as regards good insulation, as but a very small surface of the wire touched the insulator. Moreover, the wire being firmly secured could not rub and thus wear off the galvanised coating, which wear, if it took place, would cause the wire to rust very quickly, and the rust to spread over the lip of the insulator and lower its insulating properties.

With reference to breakage of insulators by lightning, Mr. Bell said that a wire connected with the earth wire and bent over towards the line wire and in close proximity to it, would be probably highly effectual.

Mr. SPAGNOLETTI stated that he found several instances of bad binding causing chafing and subsequent breakage of the wire at the insulator. Speaking of preserving the wooden poles, he remarked that ordinary timber so preserved would last for 20 or 30 years without decay. Mr. Spagnoletti said that the difficulties of transport of materials in Africa might possibly be got over by the employment of elephants.

Mr. LATIMER CLARK said that a form of insulator with a lightning guard had been sent out to India several years ago, by Colonel Robinson, but that he had not heard whether it had been used with success.

Mr. PREECE, in commenting on Mr. Sivewright's paper, said that the question of most interest raised by it was that of a land line versus a cable to complete communication with Europe. In discussing the question, Mr. Preece expressed his opinion that taking into consideration the various accidents to which land lines and also cables were liable, there was not much to choose between the two schemes. He considered the chances of the wire being interrupted by natives as small, and also the unhealthiness of the climate as exaggerated. As to the erection of the line, Mr. Preece pointed out that the line might be divided into sections of 400 miles each, and stores would have only to be carried that distance. The question of cost he considered as the same in both cases.

Kyanizing, in Mr. Preece's experience, was not successful, as although for ordinary timber as used in bridges it might be effectual, yet, when applied to telegraph poles, they were always found to decay at the wind and water line; creosoting was the only really successful process. Compound wire was stated to be unsuccessful, as it split, and the coatings became separated from the centre wire. The American electrotyped wire was inferior both in conductivity and strength to ordinary No. 8 galvanised iron wire, as used by the Post Office.

Sir CHARLES BRIGHT differed from Mr. Preece as to the relative merits of a land and an ocean line, as he considered a cable preferable. A land line erected in Persia, where the obstruction from natives were comparatively small, took several months longer to complete than a cable down the Persian Gulf.

Professor AYRTON drew attention to the underground system employed in Germany, as showing that open work was considered there as undesirable. With regard to the insulators referred to by Mr. Latimer Clark, he stated that the form had been used at terminal poles, and with success.

Dr. SIEMENS preferred a cable to a land line as being less subject to accidents. With regard to the route which the cable should follow, he strongly advocated the cable being laid between Southern India and the Mauritius, as a coast cable would be more subject to accidents than a deep sea one; it was especially objectionable to have a coast cable in shallow water in the tropics. An underground cable through Africa was not advocated; but he expressed his opinion that such cables would be more generally adopted than at present. While advocating a cable at the present time, Dr. Siemens thought it probable that a land line would eventually be erected in addition.

Major CHAMPAIN said that a land line ought to be erected about 100 yards from the main road, but so as to be in sight of a man on horseback. Iron poles he very strongly advocated as being cheaper in the end than wood, and in Africa, where transport was expensive, he thought they would be cheaper, in the first instance, from their lightness. In Persia, the poles were protected from cattle by erecting low rubble walls around them, or by surrounding them with a trench. As regards land lines, he stated that although the Persian line was at first thought to be impossible, it was afterwards erected without very great trouble. The growth of tropical vegetation, Major Champain stated, was probably quite as heavy in certain parts of India as in Africa, and yet it was found possible with a little trouble, to keep the wires clear.

In commencing the discussion of Professor Hughes' paper on "Induction on ærial lines," Mr. Preece gave some results of experiments he had made to determine the effect of induction between wires through which heavy currents were passed, as in electric light circuits. The results showed that induction was not prevented by surrounding the wires by large iron pipes, as in the ordinary street work. As a consequence of these experiments it was decided by the Postal Telegraph authorities to oppose the placing of electric light wires laid under ground. With regard to Professor Hughes' method of neutralising induction, Mr. Preece stated that the effects of induction were not felt to any appreciable extent on lines, and that, therefore, the invention would not be of use.

Professor HUGHES, as the result of experiments, stated that iron tubes in no case would shield wires enclosed in them from induction. As to induction between wire and wire, he stated that in France, where all the wires on the poles were in the same plane, induction was very strongly felt, the effect on a neighbouring wire being equivalent to a battery of one-tenth of the working power. The effect was particularly noticeable on his form of printing instrument. In speaking

* A description of this insulator is given on page 127 of the present number of the JOURNAL.

of the claim made by Edison to be the discoverer of the method of neutralising induction, Professor Hughes stated that as the patent specification of Mr. Edison had not been published, it was quite impossible for him to say whether any distinction existed between the two methods, especially as none of Mr. Edison's representatives appeared to be present at the meeting to support the claim.

The meeting then adjourned till April 23rd.

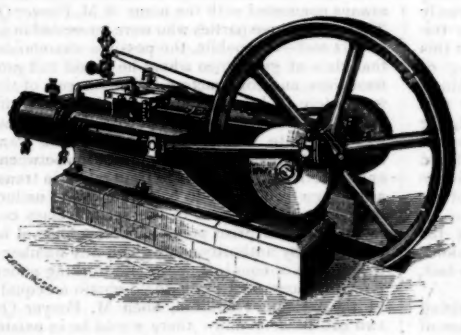
General Science.

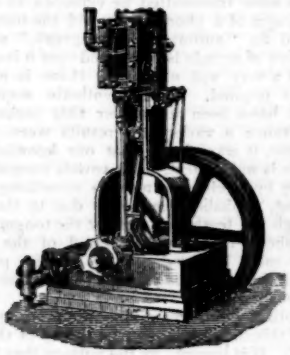
ENGINES FOR WORKING ELECTRIC LIGHT MACHINES.

III.

Engines of the "Atlas" Engine Company.

IN the design of the Horizontal "Atlas" Engines, a figure of which is here given, it has been sought to embody all the advantages of the original "Allen" Engine frame, together with an improved shape and





finish in the details. Thus, while the guide bars, front cylinder, cover and main carriage are cast in one with the bed, the base is carried out into a square shape so as to facilitate foundations and ensure a more even distribution of the bearing surface and of the holding-down bolts. The square bars have been retained, but the crosshead is of improved design, with slippers adjustable by means of a wedge and screw so that it can be slipped on in any position. With the exception of the guides and the outline of the base all straight lines and angles have been done away with, so that the design is harmoniously curved through. The frame being of the box girder pattern is light and strong. The combination of the slide-valve spindle with the feed-pump plunger provides the former with the best form of guide in the right place, and has also the advantage of throwing only a "tensional" strain on to the eccentric rod.

In the "Atlas" Vertical Engines the vertical tubular frame merges into a square hollow base in which are cast two carriages to receive a double crank shaft. The guides are cylindrical, form part of the frame, and are cast with oil boxes opening outside the frame. Both horizontal and vertical engines are made to gauges, so that any part can be easily replaced at any time.

The "Atlas" Engine Company have been trying several kinds of governors, with a view to finding out the best, and hope to introduce shortly a very superior one.

When combined with vertical boilers the "Atlas" engines are fixed on a hollow foundation plate, forming a tank, in which the feed water is admitted and is warmed by the heat of the under part of the furnace.

We may mention that "Altas" Engines were selected to drive the Dynamo-Electric Machine at Aston, near Birmingham.

MECHANICAL PRODUCTION OF SPEECH.—Mr. W. H. Preece and Mr. Augustus Stroh, the eminent mechanician, recently brought before the Royal Society the results of a classical study in acoustics, which really form the first step towards mechanically building up speech. The phonograph has given a great stimulus to this subject; but its own efforts while being mere *reproductions* of speech, are somewhat imperfect, owing to the merging of the labial and dental sounds into one another, and the absence of all the sibilants and generally of the "noises" of speech. Helmholtz's theory of vowel sounds is this:—Vowels are compound musical tones, or resultant sounds formed by the combination of certain components or simple tones called partials. The first partial, which determines the pitch of the whole, is called the prime, and the others its upper partials. The partials depend upon the reinforcements due to the cavity of the mouth. They do not depend upon the pitch of the prime alone, or on the grouping or harmony of the partials alone, but on both. The ear must distinguish each component; it must recognise the kind of cavity producing the reinforcements, and therefore it determines the different vowels. This theory has been partly confirmed recently by Messrs. Fleeming Jenkin and Ewing, by an analytical examination of phonographic tracings, fully described by them in a paper read before the Royal Society of Edinburgh.

The method pursued by Messrs. Preece and Stroh was the reverse of that followed by Messrs. Jenkin and Ewing. They first constructed a new instrument for

recording the curves of vowel sounds, that is, the motions of the sonorous air after the manner of Barlow's Logograph, or Leon Scott's Phonautograph. For this purpose they selected a vibrating diaphragm of thin sheet india-rubber rendered rigid by a cone of paper, as giving the best results, and connected it to a fine glass pen, which recorded the vowel vibrations on a strip of moving paper. They next had constructed an ingenious and beautiful "synthetic curve machine" (the work of Mr. Stroh), which, by an arrangement of toothed wheels actuating a marking lever, produced these vowel curves mechanically, and showed how vowel tones are compounded of primes and harmonic upper partials. It also showed how *simple* tones can be produced by simple harmonic curves, and *compound tones* by the simultaneous action of several simple tones. The point of the marking pen of the lever itself swings backwards and forwards precisely in the same way as does a particle of the air conveying the tones.

Having thus mechanically produced vowel curves, the next aim of the authors was to mechanically produce the vowel sounds themselves by superimposing partials on a given prime. They therefore constructed an apparatus upon which discs were fitted, whose peripheries were cut in an exact copy of the curve produced by the "synthetic curve machine." These curves were transmitted by vibration to the receiving diaphragm of a phonograph, and the instrument really formed an "automatic phonograph," as far as the emission of sounds is concerned; but it is clear that this is not a very apt name, for there is no writing of sounds implied. The "synthetic sound machine" would have been a happier title perhaps. By this contrivance a variety of results were obtained, for example, it was shown that our knowledge of vowel sounds is not perfect, since vowels cannot be produced exactly by mechanical means: something being always missing, probably the noises due to the rush of air through the teeth, and against the tongue and lips. It also shews that a vowel sound of the pitch of the prime may be produced by certain partials alone, without sounding the prime at all. The beat, in fact, becomes the prime.

Another point remaining for investigation arising out of this inquiry, is the true theory of the loudness of sound. It is thought by the authors that loudness does not depend upon amplitude of vibration only, but also upon the quantity of air put into vibration; and, therefore, there exists an absolute physical unit in acoustics analogous to the unit of quantity of electricity or quantity of heat, and which may be called the quantity of sound. In fact, in the automatic phonograph the diameter of the sounding disc ought, if it were possible, to vary with the pitch of each note, to produce equal intensity of sound.

The authors are now engaged in pursuing this inquiry into the consonantal sounds.

City Notes.

Old Broad Street, April 10th, 1879.

ANGLO-AMERICAN TELEGRAPH COMPANY.—The directors have issued the prospectus of a new company to be called the "Compagnie Frangaise du Cable Transatlantique," with a capital of 20,000,000 francs, (£800,000). This project has for its object the re-transfer to a French Company of the working of the telegraphic line between France and America, and providing for the renewal of the present cables. The Anglo-American Telegraph Company are the owners of this line, which they acquired from the Societe du Cable Transatlantique Frangais. All the telegrams between France and America are transmitted direct via Brest, St. Pierre and Duxbury, except in cases of interruption, when they are sent by the three English cables. The four cables above mentioned are more than sufficient for carrying all the present traffic, and they are equal to the transmission of a much larger correspondence. The Anglo-American Company agrees to transfer to the French Company the Concession granted by the French Government, dated 6th July, 1868, and the working of the present cables from Brest to St. Pierre, and from St. Pierre to Duxbury, and the use of the stations. Further, the French Company will be admitted to the joint purse arrangement existing between the Anglo-American and Direct Cable Companies.

At an extraordinary general meeting held on the 8th inst. at the City Terminus Hotel to receive the above report from the directors, Lord Monck, the chairman, presided, and at the outset of his remarks said the notion of getting up a company in France to compete with the companies in England was by no means a new one, and the rumours as to such an intention were always connected with the name of M. Pouyer Quertier. There were three parties who were interested in a scheme of this sort—the public, the possible shareholders, and that class of gentlemen whom he would call promoters, financiers, and constructors. The interest of the public was solely in having the traffic conducted efficiently, and it was not even pretended that this competing line was meant to subserve any great public want, or to improve the telegraphic communication between Europe and America. The average time taken in transmitting a message from Paris to New York was under twenty minutes. With regard to the second class concerned in such an enterprise, possible shareholders, it had been laid down by authority that, given any number of telegraph lines of equal efficiency and working under similar circumstances, each cable would obtain an equal amount of the traffic. Therefore, when M. Pouyer Quertier's two cables were down there would be in existence six cables, three belonging to the company, one to the Direct United States Cable Company, and these two, and consequently the proportion of traffic obtained by M. Pouyer Quertier would be one-third. That, however, was assuming that all things were equal; but this company and its colleague, the Direct Company, had by special agreements the right to bring almost every message which crossed the Atlantic from America here, and they had priority in, he believed, all European countries over any other company which might exist—that was to say, the Governments of all European countries, France included, were bound to send all messages transmitted to them by these two companies' lines, unless the sender directed to the contrary. Did any reasonable man think that 8 per cent. would be a fair allowance to make for these enormous advantages? But even such an allowance would reduce M. Pouyer Quertier's proportion of the traffic from one-third, or 33 per cent., to 25 per cent. In his prospectus that gentleman coolly and quietly said he expected to get 48 per cent., but he had dropped down to 40 per cent. He (the speaker) asserted, however, that he would not get more than 25 per cent., or £178,750. The working expenses, taking the expenses at one-third more than those of the Direct United States Cable Company, who worked only one cable, would be £67,000, the reserve, which should be laid by

in the same proportion as the Anglo and Direct Companies adopted, would be £100,000, and M. Pouyer Quertier's own estimate for the redemption of his bonds was £32,000, making in all £199,000, or about £11,000 more than he would receive as his share of the traffic. Could any man of common sense conceive that a third participator in the same revenue would be better off in the market than the Anglo and the Direct Companies? There was no pretence that the gross revenue of Transatlantic telegraphy would be increased by this operation. He was sorry to say that the Direct Company and themselves commanded about the same proportional price in the market, or a depreciation of about 40 per cent. (A Voice. —45.) With regard to the third class interested in such a project as this, promoters, financiers, constructors, and so forth, he had not a word to say against the class as a whole, but he thought their operations ought to be scanned very closely and criticised very sharply by those who proposed to be shareholders in their undertakings. M. Pouyer Quertier and his friends threw a very graceful haze over the whole thing as to where the money was going, yet he shrewdly suspected that a great deal would go into the pockets of men who would not give any great value for it. When they saw that this scheme was taking a definite shape they took measures to protect the shareholders' interest, and they sent over to Paris and tried to make terms; but they led to nothing, and they had now to meet the question boldly. They, therefore, asked the shareholders to arm the directors with such powers as would enable them to undertake the war effectually on their behalf. Their colleagues of the Direct Company were entirely with them. The report and the memorandum annexed to it would reveal to the shareholders the steps they proposed to take in order to meet the French company. He might add that if the company which they themselves had projected should be constituted, it would work in harmony with this company, and there would be no change of traffic and no important alteration in the management of the business without the concurrence of the company and of the Direct Company. He then moved a resolution authorising the directors to take any steps they might deem requisite or desirable for giving effect to the project set forth in the printed report of the directors, dated the 31st ult., and the memorandum annexed thereto, &c. Sir Daniel Gooch, M.P., a director, seconded the motion, which was at once carried unanimously without discussion—a circumstance which caused some surprise to not a few of those who were present. A vote of thanks to the chairman terminated the proceedings.

MEDITERRANEAN EXTENSION TELEGRAH COMPANY (LIMITED).—The Forty-third Ordinary General Meeting of the shareholders of this Company was held on Wednesday, the 2nd of April, at the Cannon Street Terminus Hotel, under the presidency of Sir James Carmichael, Bart., the chairman of the Company. The report stated that in the past half-year there had been a falling off in the revenue as compared with the previous half-year, which was due to the suspension of traffic between Otranto and Corfu for almost the entire period of the last quarter, in consequence of the cable being injured. They had been compelled to call on the Government for the full amount due under the guarantee. The Chairman, in moving the adoption of the report, said: I have to express very great regret, both on my own account and that of my colleagues, that this meeting has been so long delayed. You are aware that it ought to have taken place about a month or six weeks ago. This delay, however, was unavoidable. It has occurred through an objection on the part of the Treasury to the form in which our accounts were sent in. We very properly, as we thought, charged the cost of our repairs, as usual, against the revenue, but the Government auditor, on the contrary, was of opinion that we should have taken the cost of these repairs out of our reserve fund. Well, we pointed out to the Treasury that that was a very unusual proceeding—that in all telegraph companies it was customary to charge the cost of the repairs of each half-year against the revenue of that half-year, and to keep the reserve fund untouched, except in the case of a partial or total renewal of cables, in which case the reserve fund became available. After considerable discussion, I am happy to say that the Treasury took our view of the matter, and eventually the accounts were passed by the Government auditor in the form in which they were at first presented. That leaves us in a position to recommend the usual dividend on the ordinary and preference stock, and to keep our reserve fund untouched for future occasions if necessary. Therefore, although the delay has been productive of some inconvenience to the shareholders, still it resulted in a favourable arrangement with the Government officials. With regard to these repairs, as stated in the report, the one respecting the repairs to the cable between Corfu and Otranto has been carried out successfully, and the cable is now in good working order. I regret to say, with regard to the Alga-Grande cable, one of the cables between Sicily and Malta, we have been obliged for the present to abandon any further efforts to repair it, and I should hardly be justified in recommending a further expenditure on the cable. The cable was laid some twenty years ago, and at that time, as you are very likely aware, it was not the custom to give the wire coating of the cable any further protection. The cable laid since then, which has been down some ten years, has been covered with a composition commonly known by the name of Clark and Bright's patent, which preserves the iron from the action of the salt water. There is the second cable, now in working order, between Pozzallo and Malta; it is in excellent order, and capable of doing all the business that we have. At present, therefore, I should not advise further expenditure on the Alga-Grande cable. Hereafter, it may be a question of renewing it, but not just now. I don't know that I have anything further to say, except that I shall be happy to answer any question from any shareholder. I now move the adoption of the report and accounts. The motion having been seconded, the report was unanimously adopted, and the dividend on the special preference stock, less income tax, and a dividend at the rate of 3 per cent. per annum on the ordinary stock, tax free, were declared.

INDO-EUROPEAN TELEGRAPH COMPANY (LIMITED).—The half-yearly general meeting of the shareholders of this Company was held on Monday, the 31st of March, at the Cannon-street Hotel, under the presidency of Colonel James Holland, the chairman. The chairman, in moving the adoption of the report (an abstract of which was given in our last issue), said it was no doubt a matter of satisfaction to the shareholders, as it was to the directors, that they are able to present a report which was so much more satisfactory than that of 1877. That year unfortunately was marked for them by the Russo-Turkish war, owing to which between sixty and seventy miles of their line of communication was destroyed, and so remained for several months. They had, however, formed a reserve fund, and that, combined with the energy of the Board, and very greatly with the energy of the contractors, Messrs. Siemens, enabled them to establish a line through the Caucasus, and the effects of the disaster were not such as to deprive the shareholders of a dividend. Although the accounts of the past year might have shown a better result, they showed that the amount received as gross revenue was larger than on any previous occasion, being over £90,000. There had been continued depression in trade, and though there were some improving prospects the

depression still continued, and so long as it existed they could not expect the average amount of business with a derangement of mercantile transactions in India and other places. The total receipts of the past year, however, had been satisfactory, and there had been a steady increase, the dividend having always been progressive, with the exception of 1877. They recommended a dividend for the past year of 6 per cent., adding £6,000 to the reserve, thus replacing the fund in its former position. Excepting a few amounts due to them from Government, every shilling of the debtor and creditor accounts had been cleared off. The gross expenses for the past year were stated at £45,539, but a sum of £589 had been expended in the purchase of the freehold of a station, and after deducting some further extraordinary amounts, the expenses were actually £500 or £600 less than those of 1877. With regard to the reserve fund, he presumed that there was no one who would question the policy of having a good reserve. The reserve fund had been their salvation in the past, and might be again, and therefore it would require no eloquence on his part to impress upon the shareholders the necessity of adding to that fund. Their policy had been to pay everything out of revenue, keeping the capital at a *minimum*. As to their claim against the Russian Government for the destruction of the wire, he had hoped to be able to announce that it had been met by the Government; but although they had met with no rebuff, the claim still remained unsettled. Government powers were slow in motion when the payment of money was concerned, but the directors would not relax their efforts, although they must not be impatient. Such a claim as theirs on the Russian Government was never refused by any civilised Government, and he trusted to hear that a considerable amount had been paid to their account, and that before long the whole claim would be satisfied. The system adopted some years ago by which representatives of the Press at distant stations were enabled to transmit messages at quarter rates when the wires were not occupied for the ordinary business of the Company had worked well to the advantage of the Press and the general public. They had made strenuous efforts, in conjunction with the Eastern and the Eastern Extension Companies, to extend this privilege still further; but he regretted to say that they had not hitherto met with much success, foreign Governments, for various reasons, finding it difficult to aid the movement. The directors would, however, still continue their exertions to carry out this object. With regard to the International Telegraph Conference, which was held every three years in one of the principal cities of Europe, it would this year take place in London, and the Postmaster-General had invited the Company and the representatives of other companies to attend it. The directors had accepted the invitation. They should strive to repay the warm hospitalities they had received abroad—whether at Vienna, St. Petersburg, or Berne, and he hoped that our Government would not be behindhand in repaying the hospitalities of foreign Governments to the British representatives at these conferences. He concluded by moving the resolution. A director seconded the motion, which was at once unanimously adopted, and the dividend as recommended was then declared.

DIRECT SPANISH TELEGRAPH COMPANY (LIMITED).—The half-yearly general meeting of the shareholders in this Company was held on Monday, the 31st March, at the offices, 106, Cannon-street.

Mr. Neil Bannatyne, the chairman, presided, and in moving the adoption of the report, a brief account of which appeared in our issue of the 1st inst., said he had no doubt the shareholders had observed that the feature of the accounts was an increase in the working expenses for the past half year, but he was glad to be able to state that the increase arose from exceptional causes, some of which would not occur again, and others not for some years. The details showed that the normal working expenses had not increased, and that the Company could carry on a large increase of traffic with the same expenses. The traffic did not come up to his expectations, but it had enabled the directors to increase the reserve fund to £1,700, and to carry forward a small balance after paying the preference dividend. They had not lost any of their customers, but they had had fewer telegrams; the area, however, from which they drew their customers was as great as ever. When a revival of business occurred he had no doubt the position of the Company would improve, but there was no immediate prospect of an improvement in the depression of trade. He concluded by moving the adoption of the report. The motion having been seconded, after a few remarks, was eventually carried unanimously.

THE WEST COAST OF AMERICA TELEGRAPH COMPANY.—The directors submit the accounts of the Company for the year ending December 31, 1878, showing the gross revenue to be £26,310 16s. 2d., and the expenditure £14,732 6s. 11d., leaving a balance of £11,578 9s. 3d. Of this amount £10,996 11s. 7d., is absorbed by payment of the Debenture Interest, and the directors propose to carry forward the balance, amounting to £581 17s. 8d., together with the balance brought forward from the old Company, amounting to £1,250 2s. 9d.

The Globe Telegraph and Trust Company (Limited) notify that interim dividends for the quarter ending 18th April, 1879, of three shillings per share on the Preference Shares, being at the rate of 6 per cent. per annum, and two shillings per share on the Ordinary Shares, being at the rate of 4 per cent. per annum, will be paid on and after 21st April instant.

Information was received on the 29th ult., by the Cuba Submarine Telegraph Company (Limited), of the repair of their 1870 Cable between Cienfuegos and Santiago de Cuba, thus restoring duplicate means of telegraphic communication with the West Indies.

The following are the latest quotations of telegraphs:—Anglo-American, Limited, 55-56; Ditto, Preferred, 85¼-86¼; Ditto, Deferred, 26-27; Black Sea, Limited, —; Brazilian Submarine, Limited, 6⅞-6⅞; Cuba, Limited, 8-8½; Cuba, Limited, 10 per cent. Preference, 15-16; Direct Spanish, Limited, 1½-2; Direct Spanish, 10 per cent. Preference, 10½-11; Direct United States Cable, Limited, 1877, 10¾-11; Eastern, Limited, 7⅞-7⅞; Eastern, 6 per cent. Debentures repayable October, 1883, 105-108; Eastern 5 per cent. Debentures repayable August, 1878, 100 103; Eastern, 6 per cent. Preference, 11½-12; Eastern Extension, Australasian and China Limited, 7¾-8¼; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 106-109; German Union Telegraph and Trust, 7¾-8¼; Globe Telegraph and Trust, Limited, 4¾-5; Globe, 6 per cent. Preference, 10¾-11; Great Northern, 8-8½; Indo-European, Limited, 21-22; Mediterranean Extension, Limited, 2¾-3¼; Mediterranean Extension, 8 per cent. Preference, 9½-9¾; Reuter's, Limited 9½-10½; Submarine, 215-225; Submarine Scrip, 1½-2⅛; West Coast of America, Limited, 1½-2; West India and Panama, Limited, 1¼-1⅜; Ditto, 6 per cent. First Preference 8¼-8¾; Ditto, ditto, Second Preference, 7¼-8¼; Western and Brazilian, Limited, 3¾-4¼; Ditto, 6 per cent. Debentures "A," 93-97, Ditto, ditto, ditto, "B," 87-92; Western Union of U. S. 7 per cent., 1 Mortgage (Building) Bonds, 114-118; Ditto, 6 per cent. Sterling Bonds, 101-103; Telegraph Construction and Maintenance, Limited, 29½-30; Ditto, 6 per cent. Bonds, 106-108; Ditto, Second Bonus Trust Certificates, 2½-2¾; India Rubber Co., 10-10½.